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## ABSTRACT

A therapeutic radiation source includes a spiral-shaped, laser-heated thermionic cathode. A fiber optic cable directs a beam of radiation, having a power level sufficient to heat at least a portion of the electron-emissive surface to an electron emitting temperature, from a laser source onto the cathode. The cathode generates an electron beam along a beam path by thermionic emission, and strikes a target positioned in its beam path. The target includes radiation emissive material that emits therapeutic radiation in response to incident accelerated electrons from the electron beam. The spiral-shaped conductive element has a plurality of spaced apart turns, and is disposed in a vacuum. An interstitial spacing is defined between adjacent turns, so that heat transfer across the spacing between each adjacent turn is essentially eliminated, thereby substantially reducing heat loss in the cathode caused by thermal conduction.